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Effect of feed additives on methane production, rumen fermentation, and milk yield in dairy cows

Mohammed Soliman*

Department of Library and Information Science, University of Port Harcourt, Port Harcourt, Nigeria

*Corresponding author. E-mail: solimanmsm@yahoo.com

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ABSTRACT

This experiment was carried out to establish the effects of three types of feed additives (green seaweed, probiotics saccharomyces cerevisiae or yucca schiagera) on *in-vitro* total gas and methane production, rumen fermentation parameters, milk production in dairy cows. Twenty Friesian cows were randomly allocated to four groups (five cows/group). All cows were fed TMR first group feed without supplemented while groups 2-3 were feed TMR supplemented with one of the feed additives at a rate of 25 g, 20 g, 100 g/head/day for probiotics, yucca and green seaweeds respectively. This study concluded that feed additives enhanced beneficial processes rumen manipulation of reduction in gas and methane production, the results were variable between experimental feed additives, the green seaweeds and yucca were showing a significant ($P<0.05$) reduction in total gas and methane production than probiotics *S.cerevisiae*. The amount of ammonia, short-chain fatty acid, and IVDMD was estimated. Dietary supplemented with probiotic or seaweeds recorded a significant increase in SCHA and IVDMD than other while dietary supplemented with yucca showed a significant decreased in ammonia concentration. The dietary supplements with probiotic and seaweeds significantly improve milk yield and well as milk composition. Generally, experimental feed additives are stimulating the immunity of the animals as well as decreased the SCC.

Keywords: Green seaweed, Probiotics, Fermentation, Saccharomyces cerevisiae, Yucca schiagera, Gas and methane production, Milk yield

INTRODUCTION

Greenhouse gas emissions are contributing a deteriorating environment, increase of global warming and cause substantial climate change nowadays. Methane is take part global warming about 21 times of carbon dioxide [1]. Agriculture field represent the wide large of the total methane emissions which estimated approximately 40% from anthropogenic sources, and about 25% coming from the rumen liquor fermentation in ruminants [2-5]. The ruminants, represent about 95% of the methane is produced *via* feed fermentation in the rumen and is exhaled through the nose and mouth; this leads to a loss of energy about 2%-12% of the feed energy, depending on the diet ingredients. Methane emissions of Egypt are increasing from 30, 346.4 kt of CO_2 equivalent in 1993 to 51, and 976.8 kt of CO_2 equivalent in 2012 that at an average annual rate of 2.92%, according to. The organic matter of feed is fermented into volatile fatty acids, ammonia, carbon dioxide and methane. The gases produced are losing energy products of the fermentation and getting rid from the rumen by eructation. Both methanogenic bacteria and protozoa are associated with methane production in rumen [6-8]. Consequently, a lot of efforts are recently ongoing to manipulate rumen fermentation and the rumen microbial ecosystem to decrease the methane production by one of the following a basic principle: Direct inhibition of methanogenesis, decrease the production of hydrogen during fermentation or alternative pathways for use of hydrogen in the rumen. Dietary strategies one of methods to reduce enteric methane emissions mainly that revolve around to achieve the one of previously basic principle. Reported that any one of these methods like the level of the feed intake, type of carbohydrate, quality of forage: concentrate ratios, and the feed additive can be effect on rumen methane emissions. Thus, use of any method to methane reduction can only be justified if there is a beneficial effect larger than the cost of the product. (These methods are done to increase milk or meat production and lower methane emission). Feed additives are products used in animal nutrition to improving the quality of feed and applied as modification strategy in rumen to improving the animal's performance and health. Feed additives defined as organic or inorganic substances, micro-organisms or preparations from plant extract, which are intentionally added to feed or water. Feed additives that used for reducing the ruminant total gas and methane emissions are ionophores, probiotic, seaweeds, saponins, tannins, organic acids, nitrates, bacteriocins, fats and oils. Most of these additives have the direct effect of rumen manipulation like inhibition of methanogenesis and lowering of the production of hydrogen during fermentation reported by Emilio. Select the feed additives to reduction methane gas are depend upon many factors like the kind of production (milk or meat) and must be had economic beneficial and safety for the animals [9]. In recent years much research has been published to investigate the possibility to reduce methane emissions and reduce the energy losses from methane production. The main targets are to reduction of methane emissions from ruminants for benefit the lost energy for utilization in animal production. Hence, it is important to select feed additive that result in reduced methane production. found that Grinding and pelleting of forages and selected one of specific kinds of feed additives can markedly decrease methane production bout 20%. Recently an increase has been observed in the feed market in the amount of feed additives, especially probiotics, as well as new types of feed additives such as dried seaweed and Yucca schiagera. It has also been noted that these additives, with different composition and benefits, have the same properties of reducing methane emission from ruminants, especially dairy cows. This study was conducted to determine the effect of green seaweed, probiotics, or Yucca schiagera as feed additives on total gas production and methane production *in vitro*, as well as determined the *in vivo* organic matter digestibility and parameters the rumen liquor fermentation and their effect on the milk production in dairy cows [10-13].

MATERIALS AND METHODS

Animals housing and feeding

This study was carried out at Noubaria station, animal production research institute. This experiment was designed to determine the effects of probiotic (saccharomyces cerevisiae), Yucca schiagera and dried green seaweeds on dray matter and organic matterdigestibility, liquor rumen fermentation, methane production, gas production and productivity of dairy cows. Twenty multiparous lactating crossbred Friesian cows (45 days ± 2 days in milk) were assigned randomly to four treatments (5 cows/each treatment) stratified by live body weight (550 kg ± 7.5 kg). All Cows were fed a Total Mixed Ration (TMR) with (60%:40%) Concentrate: Roughage to meet their nutrient requirements according to NRC (2001) recommendations. The nutrient contents of feed ingredients are shown in Table 1. The experimental treatment consists of four treatments [14].

Table 1: Ingredients and chemical composition of the total mixed diets.

Item	TMR
Ingredients (g kg^{-1} DM)	
Corn silage	400
DDG	40
Corn	140
Wheat grain ground	130
Wheat bran	120
Soybean meal ground (46% CP)	150
Calcium carbonate	13

Salt (NaCl)	2
Vitamin-mineral premix	5
Total (%)	1000
Chemical composition,(g kg^{-1} DM)	
Dry matter	651.8
Crude protein	158.1
Ether extract	29.7
Neutral detergent fiber	395.1
Acid detergent fiber	234.7
Acid detergent lignin	36.1
NFC	373.6
Starch	254.8
Ash	62.7

- Control group cows feed Total Mixed Ration (TMR).
- Cows were fed TMR and supplemented with 25 gm/ head/day of commercial probiotic containing (saccharomyces cerevisiae 2.5 CFU/g × 109 CFU/g of active yeast cells Levucell®).
- Cows were fed TMR which blended with 20 gm/ head/day of yucca schiagera (105 g saponins/kg powder yucca schiagera NHK™).
- Cows were fed TMR which blended with 100 gm/ head/day of dried green seaweed (Ulva lactuca ocean feed™).
- Diets were offered twice a day at 07:00 pm and 19:00 pm. Samples of TMR were taken daily, dried at 60°C in a forced-air oven for 48 h (AOAC, 2005) and stored for chemical analysis [15].

Feed intake milk sampling and milk composition

Feed intake was recorded daily by weighing the offered rations and refusals from the previous day. Cows were machine milked twice daily at 06:00 and 18:00 pm, and samples (100 ml/l of recorded milk yield) were collected at each milking. A mixed sample of milk (proportional to amounts produced in the morning and evening) was taken daily. Milk samples were analyzed for total solids, fat, protein, and ash according to methods of Ling (1963), lactose was calculated by difference. Average yields of each milk component were calculated for individual cows by multiplying milk yield by the component content (g/kg) of milk. Fat corrected milk (4%) was calculated according to Gaines, using the following equation: FCM 4%=M (0.4+0.15 F%) Where M=milk yield, F=Fat percentage. Milk energy value (E) was calculated according [16].

E (kcal/kg)=(%fat × 92)+(% protein × 58.6)+(% lactose × 39.5). Energy-Corrected Milk (ECM) was calculated according as: ECM (kg/d)=(milk production × (383 × % fat+242 × %protein+783.2)/3140). Milk samples for Somatic Cell Count (SCC) the milk samples were heated to 40°C in a water bath and held at this temperature for 15 min. Then the samples were processed in the out counter device according [17].

Sampling and analysis of rumen fluid

Ruminal fluid contents were sampled at 0 times before feeding and at 3 h and 6 h after the morning feeding using stomach tubing from cows from day 21 to day 24. Approximately 100 mL of rumen fluid were collected, from each treatment (the same cows used in the lactation trials) and strained through 4 layers of cheesecloth. The supernatant was used for determination pH immediately using a pH meter. Approximately 10 ml of the sample was preserved with 2-3 drops of formalin to prevent fermentation. Ammonia-N (NH_3-N) was determined according to (method 973.49, AOAC, 2000). The concentration of Total Short Chain Fatty Acid (TSCFA) was determined according Anderson and Yang (1992) [18]. Concentration and molar proportions of individual SCFA were measured by gas-liquid chromatography. Separation process was carried out with a capillary column and flame ionization detection. The column temperature was adjusted to 100°C for 1 min, and then increased by 20°C/min to 140°C, and then by 8°C/min to

200°C, and held at this temperature for 5 min. Helium was used as the carrier gas [19].

Measurement of gas production

In vitro gas production was determined as described by Rumen, fluid was collected before feeding in the morning using stomach tubing from cows fed a TMR [20]. Rumen fluid was strained through four layers of gauze into a pre-warmed, insulated bottle. All laboratory handling of rumen fluid was carried out under a continuous flow of CO_2. Samples (200 mg ± 10 mg) of the oven-dry feedstuffs and the respective mixtures were accurately weighed into 100 ml glass syringes fitted with plungers. *In vitro* incubation was conducted in one run involving quintuplicate samples. Syringes were filled with 30 ml of medium consisting of 10 ml of rumen fluid and 20 ml of buffer solution as described by [21]. Three blanks containing 30 ml of medium only were included in each assay to correct for gas production. The syringes were placed in a rotor inside an incubator (39°C) with about one rotation per min. Cumulative gas production was recorded at 3 hours, 6 hours, 9 hours, 12 hours, 24 hours, 48 hours, 72 hours and 96 hours of incubation. Total gas values were corrected for the blank incubation, and reported gas values are expressed in ml per 200 mg of DM. Gas production was fitted to the non-linear equation model of exponential (EXP0). EXP V=VF (1-exp (kt)) where: V: Is the cumulative gas production (in ml) at different incubation times, VF: final asymptotic gas volume; (VF=Vfinal-V0-GP0) where:

V final=The final volume of gas recorded at the end of incubation time, V0=The initial volume of gas recorded before incubation starts [22].

GP0=The mean blank value.

k: Fractional rate of gas production, t: Incubation time (h).The fractional rate (μ, h-1). Where, μ=the point of inflection of the gas curve at time t).

To, simplify methane measurement, used 100 ml glass syringes fitted with an extra outlet containing a gas-tight septum for sampling from cumulative gas production. After incubation time at 24, 48, 72 and 96 methane was measured by taken samples 1 ml from headspace gas from each syringes by evacuated vials and injecting into Gas Chromatography (GC) with flame-ionization detection. After gas was sampled for CH_4 and total gas production was measured. At the end of the fermentation period, the fermented residues were filtered into pre-weighed filter crucibles, dried for 24 h at 105°C and weighed and *In vitro* Dry Matter and Organic Matter Digestibility (IVDMD), (IVOMD) was calculated by a modified Tilley and Terry (1963) technique [23].

(IVDMD) was calculated after incubation using the following equation:

IVDMD (%)=[(1-((residue weight (DM) (sample after incubation)-blank)/sample weight) (DM) × 100].

RESULTS

Table 2: Rumen fermentation and *in vitro* dry matter digestibility of lactating crossbred Friesian cows feed rations.

Item	Control	Probiotics	Yucca	Seaweeds	SEM	P-value
In vivo Ruminal pH	6.66	6.56	6.7	6.61	0.38	0.095
In vivo Ruminal NH_3-N (mg L^{-1})	14.17	12.98	11.41	13.86	0.54	0.046
In vivo Total SCHA (mmolL^{-1}	103.10	105.51	99.71	102.80	7.54	0.038
Acetic, C_2 (ml/100 ml)	62.13	64.91	58.67	62.36	3.57	0.005
Propionic,C_3 (ml/100 ml)	24.88	25.43	26.45	25.11	0.69	0.017
Butyric, C4 (ml/100 ml)	12.33	13.84	11.60	13.58	0.44	0.043
C_2:C_3 ratio	2.49	2.55	2.21	2.47	0.06	0.008

Total gas production	56.07	52.82	48.21	47.69	0.57	0.017
Methane production at 24 h	7.80	7.05	6.62	6.10	0.19	0.011
IVDMD	50.22	53.32	48.02	51.92	0.24	0.005
IVOMD	52.04	55.41	49.55	54.36	0.016	0.007

Rumen fermentation, *in-vitro* dry matter digestibility and *in vitro* organic matter digestibility

The results obtained from rumen pH were not influenced by the additives, whether probiotics (*S. cerevisiae*), green seaweed, or yucca [24]. Despite the probiotics (*S. cerevisiae*) and seaweed treatments tended to decline of rumen pH, it was insignificantly compared to other groups. The results of Short Chain Fatty Acid (SCFA) and ammonia N concentration showed in Table 2. The results indicated that the total concentration of short-chain [25].

Fatty acid (SCFA), acetate concentrations and a percentage of acetic: Propionic (A:P) were higher (P<0.05) with the cow feed rations supplemented with probiotic than other groups. Whereas, Yucca treatment had shown a lower (P<0.05) statistically significant effect on total SCFA and decreased acetate: Propionate compared to the other groups. The rumen fluid ammonia N concentrations had a tendency (P<0.05) to decrease of cows fed ration supplemented with probiotics (*S. cerevisiae*), however, the lowest (P<0.05) values recorded with the cow fed ration supplemented with yucca, the lowest (P<0.05) was approximately about 19.47% compared to the results obtained from the control group. At the same time, the additive of green seaweed (*ulva lactuca*) has no effect on rumen ammonia N concentration or total SCFA compared to control group. The effects of additives probiotic (*S. cerevisiae*), green seaweeds, or yucca on *In-vitro* Dry Matter Digestibility (IVDMD) and *In-vitro* Organic Matter Digestibility (IVOMD). It was observed that IVDMD and IVOMD was higher (P<0.05) by 6.2% and 6.5% with probiotic (*S. cerevisiae*) respectively, compared with control. Also, the additive of green seaweed recorded an increase (P<0.05) of values of IVDMD and IVOMD by 3.4% and 4.5% respectively, compared with the control group. On the other hand, the results obtained from additive yucca, observed that a significant reduction of IVDMD and IVOMD 4.4% and 4.8% respectively (Figures 1 and 2) [26].

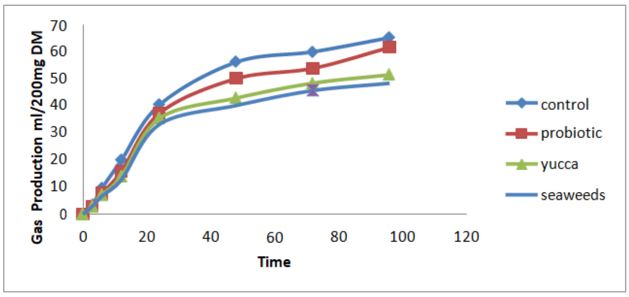

Figure 1: Gas production ml/200 mg DM.

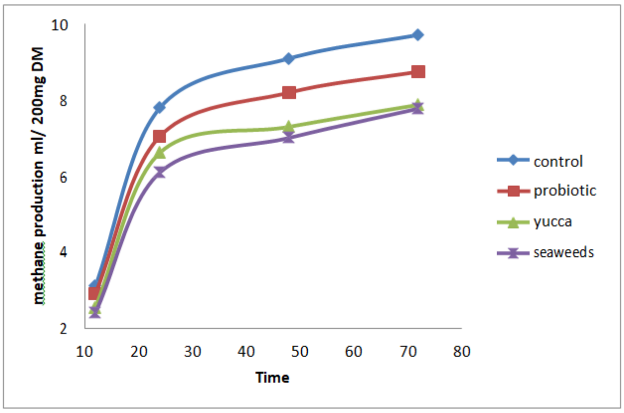

Figure 2: Methane production ml/200 mg DM.

***In Vitro* gas production**

Figure 1 displays the effects of additives on the accumulated gas production corrected for blank. The cumulative volume of gas production increased with an increase in incubation time. The cumulative gas production was influenced by the additives, the values after 96 h of incubation was ranged from 61.1 ml to 48.3 ml per 200 mg of dry matter for the control and the green seaweeds respectively. The results of total gas production are presented in Table 2. The results showed that the experimental additives [27].

Lead to a significant (P<0.05) decrease in total gas production compared to the control. Additive green seaweed had the lowest (P<0.05) value of total gas production following by yucca following by probiotic (*S. cerevisiae*) respectively. The rates of values gas production were 0.0704, 0.0673, 0.0604, and 0.0591 for to the control, probiotic (*S. cerevisiae*), yucca and green seaweed respectively. Also, the rate of gas production values was affected by additives and recorded lower rates values than the control. Methane production was strongly affected by green seaweed (P<0.05) after 24 h-48 h of incubation. The results of methane emission after 24 h incubation and displays the effects of experimental additives on the methane production at 12 hours, 24 hours, 48 hours and 72 hours of incubation. Reduction of CH_4 production was observed (P<0.05) with the diets containing feed additives after 24 h, 48 h and 72 h of incubation. The control diet had highest CH_4 productions at 24 h, 48 h and 72 h of incubation (P<0.05). The additives led to a reduction in methane production within approximately about 10%, 17% and 20% for probiotic (*S. cerevisiae*), yucca or green seaweed respectively, compared to control (Table 3) [28].

Table 3: Dry matter intake, milk yield and milk composition of lactating dairy cows (mean ± SE).

Item	Control	Probiotics	Yucca	Seaweeds	SEM	P-value
DMI, kg/d	17.70	18.12	16.85	17.97	0.72	0.024
Milk yield kg/d	18.12	19.47	17.67	19.10	0.81	0.038
4% FCM	16.95	18.39	16.37	17.95	0.93	0.017
Fat, kg/d	0.65	0.71	0.62	0.69	0.67	0.005
			Milk composition (%)			
Total solids	11.68	11.77	11.7	11.8	0.45	0.72
Fat	3.57ab	3.63	3.51b	3.60a	0.08	0.008
Protein	3.16b	3.18	3.23a	3.19b	0.26	0.003
Lactose	4.23	4.26	4.25	4.27	0.18	0.027
Ash	0.72	0.7	0.71	0.74	0.04	0.064
SCC × 10^3/mL	93.2	82.1	79.6	77.8	5.31	0.041
Milk energy content (kcal/kg)	680.72	688.58	680.08	686.8	11.52	0.018
Energy-Corrected Milk (ECM), kg/d	16.82	18.25	16.37	17.85	0.67	0.012

Dry matter intake, mike yield and milk composition

The effect of additives on Dry Matter Intake (DMI) is presented in Table 3. Dry Matter Intake (DMI) was tend to increase 2.4% and 1.5% for dairy cows fed ration supplemented with probiotic (*S. cerevisiae*) and green seaweeds respectively without significant differences (P<0.05) with the control diet. While the lowest (P<0.05) fed intake recorded with cows fed ration supplemented with yucca was decreased 5.4% compared to control diet [29].

Results of the daily milk, FCM (4%) production and milk composition are presented in Table 3. The present study indicated that the average daily milk production and daily milk yield 4% FCM was influenced by experimental additives. The dairy cows fed rations supplemented with *S. cerevisiae* or green seaweeds showed an increased (P<0.05) with a significant differences (P<0.05) than those fed ration supplemented with yucca or fed control ration. Despite, the dairy cows supplemented with yucca recorded the lowest (P<0.05) actual milk production and 4% FCM yield, the milk protein composition was significantly (P<0.05) increased compared to other groups. The additives were clearly reflected in the milk fat composition Table 3. Additive probiotic (*S. cerevisiae*) had significantly (P<0.05) increased milk fat while, additive green seaweeds had a negligible increase effect in milk fat compared with control. In contrary additive yucca had recorded lowest (P<0.05) value of milk fat%. No significant differences (P<0.05) were found for milk lactose (%) among rations [30].

DISCUSSION

Ruminal pH is an important indicator of normal rumen function. Dietary treatments had no effects (P<0.05) on the rumen pH [31]. The changed very little, ranging from (6.56 to 6.70) that may be attributed to the rumen has buffering capacity to keep pH in the normal range for active of cellulolytic bacteria this results are agreements with results obtained who found that adding probiotics to ruminant rations were more effective in stabilizing rumen ph. Also found that administered yucca to ruminants hasn't impacted rumen ph. On the other hand additive Yucca in this study, leads to a decrease in the ammonia nitrogen concentration. These results are in-agreement with who concluded that Yucca extracts contain sarsaponin, (*steroidal saponins*) which can impact rumen fermentation and decreased rumen ammonia concentrations as a result of a decreased of proteolysis. Furthermore, numerous studies had been demonstrated that Yucca extracts decreased total SCFA productions, acetate proportions and increased propionate. Observed that saponins have a capability to inhibit the protozoa population and decreased the total tract digestibility of dry matter, organic matter and fiber. On the contrary, probiotic (*S. cerevisiae*) supplementation had been improved rumen function and led to increasing of individual and total (SCFA) concentration and acetate: propionate reported by [32]. The results are in consent to a study by Alvin P, who illustrated that the concentrations of the total (SCFA) and acetate increased at the expense of propionate with live yeast supplementation. Also, found that *S. cerevisiae* was able to stimulate cellulolytic rumen bacteria and an affecting factor of most promotes rumen fermentation and increased the acetate. Furthermore, additive of probiotics (*S. cerevisiae*) led to a reduction of ruminal NH_3-N concentrations, this result was an agreement with results obtained who suggested that lower NH_3-N concentration have been due to implicate to growth and increased rumen bacteria that consuming NH_3-N in rumen pool [33]. This hypothesis is corresponding with Hristov who found that when active dry yeast (*S. cerevisiae*) is supplemented to ruminant may improve the utilization of ruminal ammonia-N, and increasing cellulotic bacteria that have a high preference for ammonia as their N source. The results obtained of additive green seaweeds (*Ulva lactuca*) can be discussed, its contain alginic acid, are a polysaccharide compound which has been demonstrated readily degraded by the rumen microbes, and production SCFA that used by microbes for growth, might speculate that a negligible reduction of ammonia-N and SCFA may be due to synchronization between SCFA as a source of energy and NH_3-N used by rumen microbes this results are consent with previous studies reported that adding seaweed to ruminant diets had no effect on rumen ammonia concentration or total SCFA. The effect of additives in terms of IVDMD and IVOMD were observed relatively high values for additive green seaweed, which contain micronutrients (essential nutrients, especially trace elements), can be improving the digestibility by ruminants, this results are in-agreement with. Who, reported that additive green seaweed to ruminant diets was led to increasing ($P<0.05$) the IVDMD than control. As well as, supplementation with probiotic (*S. cerevisiae*) had improved the *in-vitro* DM and OM digestibility, recorded higher values of IVDMD and IVOMD by adding active yeast to ruminate ration than the control group, that may be due to stimulating rumen bacteria growth and fermentation, consequently enhanced DM and OM digestibility. In contrast, the results of additive yucca led to a significant decrease in IVDMD and IVOMD. Several studies observed the decline in IVDMD and IVOMD due to the addition of yucca to ruminate diets have been reported by. Furthermore, and Hess et al., (2003) speculated that saponins might reduce the activity of digestibility organic matter and Neutral Detergent Fiber (NDF) as results to lower rumen microbial. It tends to lower not only the digestibility of fiber faction, but other nutrient [34].

The effects of feed additives probiotic (*S. cerevisiae*), yucca and green seaweed on rumen total gas production and CH4 production were examined in *in-vitro* conditions. The results showed that when *S. cerevisiae* were additive to the diet the gas production and methane are decreased. Since the *S. cerevisiae* might stimulate ruminal acetogenic bacteria, which produce acetate from CO_2 and H2. Furthermore, several studies have been reported that *S. cereviae* produce many important fermentation metabolites and contain an important mineral and enzymes that represent essential growth factors for lactic acid fermenting bacterial species, such as Megasphaera elsdenii and enhanced hydrogen utilization of acetic acid producing bacteria and Weinberg (2003). So, it can be predicted that the increment of metabolic hydrogen usage led to reduction of ruminal methanogenesis. Probiotic yeasts live cells. Probiotic yeasts live cells have been investigated by reported that the yeast live cells can persevere as long as 24 hours-30 hours in the rumen, demonstrated that the yeast viability in the rumen plays a role in the effects observed on the rumen microflora. Additives yucca schiagera statistically reduction of total gas production and methane may be attributed to saponine containing a complex compound of saccharide are react with steroid in the protozoal cell membrane, causing a breakdown of the membrane, cell lysis, and death (saponins have surfactant properties attached to sterols in protozoa cell membrane).Thus, reductions in ruminal protozoa numbers suggested that defaunation generally led to a decrease in rumen methanogenesis found that about 25% of ruminal methanogensis association with protozoa. Therefore, adding yucca led to inhibition of methanogens that interact with other ruminal microbes, including protozoa, bacteria, and fungi, through interspecies H_2 transfer hence come to stop hydrogen transferred. Overall, the yucca may inhibitory effects on hydrogen producing bacteria. Attwood et al (2008). These results were consistent with previose studies done by reported that saponins can act directly on methanogens and ciliate protozoa to reduce total gas production and methane production [35].

A significant decrease in gas production and CH_4 production were observed in this study when used green seaweeds as feed additive. Due to, seaweeds have a high proportion of organic minerals, polysaccharides, proteins, lipids (the majority of lipids are polyunsaturated fatty acids), vitamins, volatile compounds, pigments and phenols they have also been shown biological activity against bacteria from a large diversity of secondary metabolites. Phenols and fatty acids are the main secondary metabolites of green seaweeds; polyunsaturated fatty acids and phenols may inhibit methane production by main effect on the rumen bacterial community and could be variations in their toxicity towards certain rumen bacteria and ciliate protozoa and hence decreased the methane emission [36].

Previous studies noted that applied seaweeds as feed additives in ruminant diets led to reduction of enteric methane emission during rumen fermentation processes that has been proven by our results. Generally all additives in this experiment may cause different changes in the microbial community and thus fermentation processes in the rumen and then reduced the gas production and methane production [37].

Dietary supplementation with probiotics (*S. cerevisiae*) or green seaweeds for dairy cows had no effects (P>0.05) Dry Matter feed Intake (DMI) this results accordance with and (2004), while additive yucca to dairy cows dietary had a negative effect (P>0.05) of DMI that attributed to contains of steroidal saponins compounds that reduced the palatability and nutrient digestibility Dairy cows feed diets supplemented with probiotic (*S. cerevisiae*) has an increased milk yield, MCF4% and fat% by 7.5%, 8.5%, 1.71% respectively this results are consent with previous studies who reported that the incorporating probiotic yeast in dairy cows trend towards improved milk production ranging from 6%-12%. A positive effect of *S. cerevisiae* additive on fat % and MCF4 % are linked to the stimulation of cellulolytic bacteria, and a preferred orientation of fermentation to acetic acid production. The same trend were observed with the addition green seaweeds increase milk yield, MCF4% and fat% were 5.4%, 6.0%, 0.85% this result in agreement with and the positive impact in milk production are previously reported by beneficial of additives seaweeds effects to dairy cows diets that providing by essential macro and micro minerals also, contains many biologically active compounds such as fucoidan (sulfated polysaccharide), betaine and glucans that promote animals immunity and might be accountable for increased milk. On the other hand, was noticed the negative effect of yucca on milk yield, 4% FCM and fat% might be attributed to increased nutrient digestibility and depression of DMI. This results are consistent with previous studies they observation that an increases in propionate concentrations and/or reductions in the acetate/propionate ratios might be reduction the 4% FCM and fat%, this results in contrast to the results obtained by and found a significant increase in milk yield after 5 week, as consequence to reduced rumen ammonia led to decreased excretion of ammonia in the form of urea through urine or as nitrogen in feces thus reduced nitrogen odor in manure and perhaps improved milk yield. Despite the significant decline dairy cows feed diets supplemented with yucca in terms of milk yield and milk fat, protein yield has increased compared with those feed rations supplemented with seaweeds or *S. cerevisiae* [38].

CONCLUSION

The dairy industry used SCC as a monitor hygienic milk quality, increase SCC lead to a change in milk composition, and causes economic losses in the dairy industry in our studies all animals are recorded normal values of SCC, but the additives led to more reduction of SCC in milk by 16.5, 14.6% and 11.9% for seaweed, yucca and *S. cerevisiae* supplemented compared to control group, respectively. That probably due to biological component in experimental additives enhance immune function and overall animal health and it‟s have antioxidant activity. In this study, the effects of three types of feed additives (yucca, live yeast, and green seaweed) on rumen total gas production and CH_4 production were examined in *in-vitro* conditions. Moreover, have been shown a possibility used these types as natural alternatives to manipulating rumen efficiency and reducing gas emissions produced by ruminants. Also, both live yeast (*S. cerevisiae*) and green seaweed had a positive effect on the milk yield production and milk composition. Future work will be later necessary to investigate further the role of probiotics (live yeasts), yucca, and seaweeds as an ecological tool to control methane emissions in the rumen without effect on animal performances.

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